LABORATORY

OF THE

INLAND REVENUE DEPARTMENT

BULLETIN No. 90

HONEY, 1903

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LABORATORY OF THE INLAND REVENUE DEPARTMENT,
OTTAWA, October 2, 1903.

W. J. GERALD, Esq.,
Deputy Minister of Inland Revenue.

SIR,—I beg to submit herewith a tabulated statement (No. I) giving a description of the samples of honey which were collected according to your instructions of March 27 last, and which have been submitted to examination in this laboratory. Before referring to the particulars given in the table, it seems necessary to make the following explanatory remarks.

Honey is generally understood to be the sweet secretion which working bees prepare by feeding on the nectar of the flowers, leaves, etc., of various plants and trees. As well known, the aromatic constituents of many of these flowers are found in the honey produced from them. Thus, in this country, clover, buckwheat and other honeys have been distinguished by their taste and aroma, while, on the continent of Europe, such names occur as linde, acacia, heath, conifer, forest and spruce honey. The nectar of flowers contains from 60 to 90 per cent of water, and both fruit sugar and cane sugar have been found in it. It experiences, in the stomach of the bee, certain changes which consist principally in an inversion of the cane-sugar. As is the case with many articles of food in Canada, 'the limits of variability' (see Section 19 of the Adulteration Act) permissible in honey have not yet been legally determined, but it seems to be generally accepted, not only by beekeepers but by the general public, that the feeding of bees in summer time with cane sugar or sugar solution, in order to increase the production, should be regarded as adulteration. This principle is expressly acted on by the association of Swiss Agricultural Chemists, who have also adopted 16 per cent cane sugar as the maximum limit which genuine honey ought to contain. Other chemists place the limit lower, and König states that natural honey may contain up to 8 or 10 per cent cane sugar. Experiments are on record which demonstrate that bees

fed exclusively on cane sugar syrup produce a honey containing as much as 30 per cent cane sugar. Besides this adulteration, effected with the co-operation of the bees, honey may also be falsified by the direct addition of cane sugar or glucose (Starch sugar) syrup, the sophisticated honey in the latter case being sometimes sold as 'Swiss honey'. Neither of these varieties is difficult of detection, but it is otherwise in cases of an admixture of invert sugar, a substance produced by the action of dilute acids on cane sugar. This sort of adulteration has long been known, especially on the continent of Europe, where the product is sold under such names as 'Turkish honey', 'table honey' and 'prepared honey'. Not unfrequently it is more honestly termed 'sugar honey', or 'artificial honey,' (*Kunst honig*), and some of it is said to have come from America, in comb made from paraffine, and labelled as 'prime American honey.' Its manufacture has increased greatly during the last ten years. It is prepared with such skill as to baffle the efforts of German chemists to distinguish it from the genuine article, although both the German and the Belgian governments have sought by every means to protect the producers of pure honey. A recent memoir, emanating from the Imperial German Health Bureau, acknowledges that the trade in this artificial honey is very considerable, and that the addition of invert-sugar to genuine honey cannot be detected. (See *Zeitschrift für Untersuchung der Nahrungs- u. Genussmittel* for June 15, 1903.)

Whether it is likely that the last mentioned variety of spurious honey is sold in Canada, I am unable to state. I doubt whether invert-sugar is manufactured in Canada, and certainly it is not imported under that name. There is, however, a considerable importation of honey itself, which is given in the Trade and Navigation Tables as follows:—

	Entered for Home Consumption for Fiscal Year ended June 30, 1902.	June 30, 1903.
Honey in the comb, or otherwise, and imitations thereof—	Lbs.	Lbs.
From Great Britain	31,856	6,209
" British West Indies	18,754	
" Austro-Hungary	6,971	51,789
" China	320	
" Germany	3,559	
" United States	85,451	62,606
Total	146,511	120,604

It would seem quite possible that some of this imported honey, upon which a duty of 3 cents per lb. has to be paid, may be of a spurious character.

The adulteration of honey by means of added water has also to be taken into consideration. The quantity in genuine honey seldom exceeds 20 per cent, and the maximum limit is not placed beyond 25 per cent by those chemists who have studied the subject.

In Table I will be found all the information, as well as analytical results, which is available regarding 99 samples of honey, which were collected in the open market and subjected to examination here. Besides the vendor's name and address, and those of the party from whom he is said to have procured the honey, there are given in a few cases designations indicating quality. Under the results of examination are given the direct saccharimeter reading, and the water percentage as the best discriminating tests for separating the apparently genuine from the apparently adulterated samples.

The direct saccharimeter reading of the 99 samples was observed in the same manner as in testing samples of cane sugar or molasses, by means of the Schmidt & Haensch improved instrument with triple field of vision. The number of degrees mentioned are therefore from observation of a 26.048 per cent solution in a 200 mm. tube. It will be observed that the great majority of the samples, 86 in number, give the levorotatory readings, said to be indicative of pure honey when an admixture of invert-sugar is excluded from consideration. It must not, however, be supposed that left hand rotation, even in the absence of invert-sugar will infallibly indicate a genuine honey. It is quite possible that honey, adulterated with a small proportion of glucose syrup,

may still give a distinct levo-rotatory reading. An experiment on this point, made by Mr. McGill, may here be put on record. 93 parts of honey reading —16·2° at 20° C. were mixed with 7 parts of ordinary glucose, reading +88° at 30° C. This adulterated honey read (after boiling and cooling the solution to correct bi-rotation) —4·3° at 20° C. The most of the samples, 69 in number, showed crystallization, while in 17 there was no such appearance. In this separation of the sugars, dextrose or grape sugar preponderates over the levulose or fruit sugar. These sugars are present in the honey itself in somewhat different proportions from those contained in invert-sugar, the levulose prevailing to a slight extent. Since 'it is held by experienced beekeepers that all genuine honey will eventually crystallize, and hence that honey warranted to remain syrupy is probably adulterated (Allen), it is quite possible that some of these clear honeys may have contained an addition of invert-sugar. No less than 13 samples showed positive rotation, and, as probably adulterated samples, were subjected to further examination, the details of which are given in a separate table, No. II. The final conclusions arrived at regarding the adulteration of these are however incorporated in Table I, while the more technical explanations regarding the methods of examination are given in a memorandum appended to Table II.

The percentage of water stated in Table I was obtained by evaporating 10 ccm of a 5 p.c. solution of the sample in crysotile fibre for 24 hours at a temperature varying from 60° to 70° Centigrade, but never exceeding the latter figure. Only 8 of the samples were found to contain moisture to the extent of 25 p.c. and over, namely:—

No. 17887	with	27.4	p.c.	and	–	reading; clear.
" 17896	"	25.6	"		"	"
" 21300	"	25.0	"		"	"
" 21301	"	32.6	"		"	cryst.
" 21305	"	28.8	"	and	+	reading; clear.
" 23101	"	26.4	"		"	"
" 17464	"	25.6	"	and	–	reading; cryst.
" 17467	"	27.4	"	and	+	reading; clear.

Significantly enough, three of these belong to the samples showing right-handed polarization and classed as adulterated. Other three belong to the class showing left-handed polarization, but suspected of adulteration with invert-sugar on account of their clearness. The remaining two gave minus readings and crystallization and are the only ones which may fairly be suspected of containing added or, at any rate, too much water.

It will be observed that some of the adulterated samples contained fragments of comb floating in the honey, which had to be separated previous to examination. This is, of course, a very different thing from honey in the comb. Most likely the general consumer might avoid adulterated honey by purchasing it in the comb and carrying out himself the process of extracting the honey.

According to the conclusions stated in Table I, the following classification may be made of the samples described in it:—

Genuine	81
Doubtful	5
Adulterated	2
Adulterated with glucose syrup	6
Adulterated with cane sugar	5
Total number of samples	99

I have the honour to be, sir,
your obedient servant,

THOMAS MACFARLANE,
Chief Analyst.

RESULTS of Analysis of 99 Samples

Date of Collection.	Number of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor or on the Label.	Quantity Collected.	Cost.	Brand or Description.
1903.		*District of Halifax.*			8 cts.	
April 16	20240	R. F. Guest, Yarmouth	Parker & Eakins, Yarmouth	3 bottles	0 30	
" 20	20263	R. B. Dakin, Windsor, N.S.	Brown & Webb, Halifax	3 "	0 20	
" 21	20264	H. E. Wilson, Windsor	Hattie & Mylius "	3 "	0 20	
" 28	20312	G. A. Burbridge, Halifax	Brown & Webb "	3 "	0 30	
" 28	20313	Hattie & Mylius "	Vendor	3 "	0 45	
" 30	20322	R. McFatridge "	Hattie & Mylius, Halifax	3 "	0 45	'Fine New Honey.'
" 30	20325	W. H. Stevens, Dartmouth	" "	3 "	0 30	
" 30	20328	E. Butcher "	Brown & Webb "	3 "	0 45	
May 1	20330	G. H. Caldwell, Halifax	" "	3 "	0 40	
" 1	20333	Brown Bros. & Co. "	" "	3 "	0 45	
April 17	4317	G. E. Hughes, Charlottetown.	" "	3 "	0 45	
" 17	4318	H. A. Ellis, Charlottetown	John Newson, Charlottetown.	3 "	0 38	
" 17	4327	G. A. Gourlie, Summerside	Henry Watson & Co	3 "	0 45	
" 17	4334	D. Gordon, Georgetown	Evans & Son, Montreal	3 "	0 45	
" 17	4340	A. McLean "	Dearborn & Co.	3 "	0 60	
		District of New Brunswick.				
" 9	17854	Puddington & Merritt, 55 Charlotte St., St. John	E. L. Colpitt & Co., Petitcodiac, Pleasant Vale, Albert Co., N.B.	3 "	0 75	'Maple Leaf'.
" 11	17856	G. M. & A. A. Barker, 100 Princess St., St. John.	R. H. Smith, St. Thomas	3 "	0 45	'Ontario Honey.'
" 14	17867	Geo. A. Moore, 109 Brussel St., St. John.	Bottled by vendor from honey in bulk.	3 "	0 60	
" 17	17885	Francis McKay, 228 Main St., Moncton.	F. W. Fearman, Hamilton	3 "	0 45	'Clover Honey'
" 17	17886	Dr. E. O. Steves, 301 Main St., Moncton.	Canadian Drug Co., St. John.	3 "	0 45	
" 17	17887	Geo. Spencer, 272 Main St., Moncton.	" "	3 "	0 35	'White Clover Honey.'
" 17	17888	J. McD. Cook, 195 Main St., Moncton.	W. D. Black, Cloverdale Apiary. Truro, N.S.	3 "	0 75	'Extracted Clover Honey'
" 21	17896	Fred Waterson, 4 King St., St. Stephen.	Canadian Drug Co., St. John.	3 "	0 60	'Clover Honey'
" 22	17904	" "	G. F. Beach, Charlotte Co., N.B.	3 "	0 60	
" 25	17916	W. A. Eastbrook, York St., Fredericton.	B. A. Goodspeed, York Co., N.B.	3 "	0 75	
		District of Quebec.				
" 16	23339	C. Peloquin, Notre Dame de St. Hyacinthe.	Vendor	3 lbs	0 30	

of Honey as sold in 1903.

Results of Examination.			Observer.	Remarks by the Chief Analyst.	Number of Sample.
Direct Saccharimeter Reading.	Water.	Physical Characters.			
°	p. c.				
— 9·0	24·6	Light yellow syrup, clear with pleasant smell.	Miss S. E. Wright.	Genuine	20240
— 7·3	24·0	Thick; strong beeswax smell, crystallised throughout.	"	"	20263
— 7.8	24·4	Clear syrup with sediment, strong beeswax smell.	"	"	20264
—32·2	17·0	Thick, crystallised throughout, strong beeswax smell.	"	"	20312
— 2·3	22·2	Deep yellow syrup, clear; beeswax smell; mild taste.	"	"	20313
—10·7	18·8	Deep yellow colour; clear; mild flavour.	"	"	20322
- 7·9	14·0	Somewhat thick; slightly smoky odour.	"	"	20325
—10·2	23·6	Yellow colour; one-half clear; the other crystallised; mild taste; beeswax odour.	"	"	20328
—10·7	19·2	Thick crystallised syrup; mild taste.	"	"	20330
—14·2	18·4	" " "	"	"	20333
—14·3	18·2	Light yellow colour; crystallised throughout.	Miss E. Davidson.	"	4317
— 9·0	18·0	Yellow; slightly crystallised	"	"	4318
—15·7	18·8	Light yellow; crystallized throughout.	"	"	4327
—15·4	23·8	Yellow; slightly granulated or crystallised.	"	"	4334
+26·4	22·4	Yellow; partly crystallised	"	Adulterated by addition glucose syrup.	4340
—16·9	22·0	Brown; partly granulated	"	Genuine	17854
—15·0	19·4	Yellow; granulated throughout.	"	"	17856
— 9·0	20·6	" clear	"	"	17867
—17·0	21·6	" partly granulated	"	"	17885
—18·3	18·2	" "	"	"	17886
—15·7	27·4	Light yellow; clear; pleasant taste.	Miss S. E. Wright.	Doubtful.	17887
—10·4	25·4	Light yellow; deposit on bottom and sides of jar; mild.	"	Genuine	17888
—13·3	25·6	Pale yellow; thick; very mild taste.	"	Doubtful.	17896
—15·8	24·6	Light yellow colour; deposit on bottom; strong beeswax smell; mild taste.	"	Genuine.	17904
—15·6	23·2	Yellow; slight froth on top; strong beeswax smell; mild taste.	"	"	17916
— 8·7	18·2	Bright yellow colour; clear; flower-like flavour.	"	"	23339

RESULTS of Analysis of 99 Samples

Date of Collection.	Number of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor or on the Label.	Quantity Collected.	Cost.	Brand or Description.
1903.		*District of Quebec*—Con.			8 cts.	
April 22	23362	W. Campbell, St. Hyacinthe	W. Myers, White's Station	3 lbs...	0 30	.....
" 28	23372	L. S. Plamondon, South Durham.	Jos. Bissonnet, Valcourt	2½ " ...	0 30	.....
" 29	23378	O. Carigan et fils, Three Rivers, Que.	Le Rochefort, Bécancourt	3¼ " ...	0 39	.....
May 1	23388	S. Jacques et fils, Terrebonne.	From farmer of Lachinail..	5 " ..	0 60	.....
April 30	23381	E. Goudron, Berthierville.	Vendor.....	3 " ...	0 30	White .....
" 30	23382	" " ..	"	3 " ...	0 30	Brown.....
May 7	23391	Simeon Papillau, Notre Dame de St. Hyacinthe.	Antoine Marcil, Notre Dame de St. Hyacinthe.	2 7/16 " ...	0 23	.....
" 15	23604	J. B. St. Pierre, St. Hyacinthe.	Sœurs du Precieux Sang., St. Hyacinthe.	4½ " ...	0 65	.....
" 15	23605	J. B. Daignault & Cie, St. Hyacinthe.	C. Peloquin, Notre Dame de St. Hyacinthe.	3 " ...	0 30	.....
		District of Montreal.				
May 5	21296	H. Poirier, 1978 St. Catherine St., Montreal.	.....	1 lb.....	0 12	.....
" 5	21297	P. Daoust, 1830 St. Catherine St., Montreal.	Gunn, Langlois & Co	1 " ...	0 12	.....
" 5	21298	A. Fournier, 1879 St. Catherine St., Montreal.	.....	1 " ...	0 12	.....
" 5	21299	G. De LaMothe, 1502 St. Catherine St. Montreal.	.....	1 " ...	0 12	.....
" 5	21300	P. Massicotte & Co., 1470 St. Catherine St., Mont'l.	John Miller, Montreal.....	2 jars ..	0 20	.....
" 8	21301	E. Limoyer, 1949 Notre Dame St., Montreal.	.....	1 lb.....	0 13	.....
" 14	21302	L. P. Lavoie, 3187 Notre Dame St., St. Cunég'de.	Hudon & Orsali, Montreal.	1 " ...	0 10	.....
" 14	21303	Robert & Frères, 229 Richelieu St., St. Cunégonde.	.....	1 " ...	0 12	.....
" 14	21304	L. Legault, 102 Coursol St. St. Cunégonde.	L. P. Lavoie, St. Henri....	1 " ...	0 10	.....
" 14	21305	W. J. Maloney, 468 St. Antoine St., St. Cunégonde.	Montreal Canning and Preserving Co.	3 jars ...	0 30	'Fine Honey Compound,' 'Banner Brand.'
		District of Kingston.				
April 30	23137	S. Fourt, Walton St., Port Hope.	.....	1 bottle..	0 20	.....
" 30	23139	D. F. McDonald, Pitt St., Cornwall.	W. Atchison, Cornwall ...	1½ lb.....	0 27	.....
" 30	23140	W. A. Dunkin, Cornwall.	R. Atchison "	1 " ...	0 15	.....
" 30	23141	D. J. Gillies "	J. McNaughton, St. Raphaels.	1 " ...	0 10	.....
" 30	23142	" "	C. C. Farran, Farran's Pt.	3 jars ..	0 40	.....
" 30	23143	R. Nichols "	.....	3 " ...	0 30	.....
" 30	23144	G. W. Armstrong "	.....	1 lb.....	0 11	.....
" 30	23145	J. E. Chevrier "	.....	1 " ...	0 12	.....
" 30	23146	G. W. Runion, Marlboro' St., Cornwall.	.....	1 " ...	0 10	.....
" 30	23138	J. Maybury & Co., Prescott.	Mrs. Robt. Johnson.....	.....	.....	.....

of Honey as sold in 1903—*Continued.*

Results of Examination.			Observer.	Remarks by the Chief Analyst.	Number of Sample.
Direct Saccharimeter Reading.	Water.	Physical Characters.			
	p. c.				
−13·7	23·4	Brownish yellow; seven-eighths of the bulk is granulated; smoky smell and taste.	Miss S. E. Wright	Genuine	23362
− 6·2	22·8	Yellow; clear; very strong beeswax smell.	"	"	25372
−12·2	22·6	Brown; clear; buckwheat taste and smell.	"	"	23378
−11·5	22·6	Light yellow syrup; thick; strong beeswax smell; mild taste.	"	"	23388
−12·5	20·0	Light brown colour; partly crystallised.	Miss E. Davidson	"	23381
−16·6	17·8	Brown; crystallised throughout; buckwheat taste.	"	"	23382
−15·7	19·2	Light yellow; crystallised throughout; smoky smell.	"	"	23391
− 5·8	19·0	Light yellow; crystallised throughout.	"	"	23604
−16·0	19·2	Yellow; crystallised almost throughout.	"	"	23605
−14·3	20·0	Light yellow colour: crystallised throughout.	Miss E. Davidson	Genuine	21296
−16·5	19·2	Light yellow colour; crystallised throughout.	"	"	21297
−15·5	19·2	Yellow; crystallised throughout; slight odour of smoke.	"	"	21298
−16·7	20·0	Light yellow; almost entirely crystallised.	"	"	21299
−16·6	25·0	Light yellow, clear; very sweet taste.	"	Doubtful	21300
− 6·0	32·6	Brown; partly crystallised; tastes of buckwheat.	"	Contains too much water.	21301
−15·8	21·0	Light yellow; crystallised throughout.	"	Genuine	21302
−18·5	20·8	Dark brown; crystallised; smells and tastes of buckwheat.	"	"	21303
−13·8	24·4	Dark brown; deposit at bottom; smells and tastes of beeswax.	Miss S. E. Wright.	"	21304
+83·0	28·8	Clear thin syrup; mild odour and not much taste of honey.	"	Adulterated by addition of glucose syrup.	21305
− 8·9	18·4	Pale yellow; granulated; flower-like flavour.	Miss S. E. Wright.	Genuine	23137
−11·1	14·6	Light yellow; granulated; pleasant taste and smell.	"	"	23139
−13·9	20·6	Light yellow; granulated; mild flavour.	"	"	23140
−15·1	19·2	" " "	"	"	23141
−14·2	19·0	Yellow; clear; mild taste & smell.	"	"	23142
− 8·8	20·0	" granulated.	"	"	23143
− 7·9	23·8	Pale yellow; thick syrup; mild taste.	"	"	23144
−17·5	20·0	Yellow; partly crystallised	Miss E. Davidson.	"	23145
−13·9	19·0	" crystallised throughout.	"	"	23146
−11·2	24·2	" strong smell and taste of beeswax.	Miss S. E. Wright.	"	23138

Results of Analysis of 99 Samples

Date of Collection.	Number of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor or on the Label.	Quantity Collected.	Cost.	Brand or Description.
1903.		*District of Toronto.*			$ cts.	
April 15	23401	Chas. Chown, 575 Yonge St., Toronto.	Jones Bros., Niagara, Ont.	3 jars	0 27	
" 15	23402	R. English, 490 Yonge St., Toronto.		3 "	0 25	
" 15	23403	F. Patience, 429 Yonge St., Toronto.	T. J. Dougall, Stouffville, Ont.	1 lb	0 15	
" 16	23404	J. M. Bothwell, Dunlop St. Barrie.	J. Gough, Crown Hill	1 "	0 10	
" 16	23405	James Vair, Dunlop St., Barrie.		1 "	0 10	
" 16	23406	Hobley Bros., Dunlop St., Barrie.	W. J. Gough, Crown Hill.	1 "	0 13	
" 18	23102	J. T. Petrie, St. Paul St., St. Catharines.	H. Freas, St. Annes.	1 jar	0 40	
" 18	23101	J. T. Petrie, St. Paul St., St. Catharines.	Upton Co., Hamilton	3 jars	0 30	
" 17	23407	John O. Carpenter, M'ket Square, Hamilton.		1 lb	0 20	
" 17	23408	C. H. Peebles, Market Square, Hamilton.		1 "	0 15	
		District of Windsor.				
April 9	22047	C. A. Nairn, Goderich.	Mrs. Strachan, Goderich	3 jars	0 40	
" 16	22065	Stuebing Bros., Berlin	F. F. Dalley & Co., Hamilton.	3 "	0 30	
" 16	22069	A. K. Roesch, Waterloo.	F. W. Fearman, Hamilton.	1 lb	0 25	
" 17	22074	John Sloan & Co., Galt	Mrs. Rose Miller	3 jars	0 35	
" 18	22080	J. A. McRae, Guelph.	H. Walker & Sons, Guelph.	3 "	0 30	
" 22	22087	Wm. Anderson, Chatham.	Mr. Chrysler	3 lbs	0 35	
" 22	22088	Hugh Malcomson "	Amos Kelly, Co. Kent, Ont.	3 "	0 35	
" 22	22091	Geo. Parrot, Glencoe	Wall & Guffy, Windsor	3 pots	0 30	
" 22	22097	James Wilson, London	E. Bainard, Glenworth.	3 "	0 35	
" 22	22098	A. P. Yeo, London.	Vendor	3 "	0 30	
		District of Winnipeg.				
April 15	17430	Jas. Freeborn & Co., Morden.	Dundas & Flavelle, Lindsay, Ont.	1 lb	0 60	
" 18	17438	J. A. Munro, Boissevain.	Deadmaris, Brussels, Ont.		0 75	
" 23	17448	R. W. McNaughton, Moosomin.	H. H. Waddell, St. Thomas, Ont.	3 jars	1 05	
" 24	17449	A. Grant, Brandon	From a farmer	3 "	1 05	
" 25	17459	J. & E. Brown, Portage la Prairie.	Bright & Johnson, Winnipeg	3 "	0 75	
May 6	17464	W. B. Francis, Winnipeg.	Dyson, Gibson Co., Winnipeg.	3 "	0 60	
" 6	17467	J. G. Hargrave "	Upton, Hamilton.	3 "	0 75	
" 7	17469	Porter & Orris "	Dundas & Flavelle, Lindsay, Ont.	3 "	0 60	
" 7	17472	Campbell Bros. & Wilson, Winnipeg.	Vendors	3 "	0 60	

of Honey as sold in 1903—*Continued.*

Results of Examination.					Number of Sample.
Direct Saccharimeter Reading.	Water.	Physical Characters.	Observer.	Remarks by the Chief Analyst.	
	p. c.				
−15·9	21·4	Yellow; partly crystallised.....	Miss E. Davidson.	Genuine.....	23401
−17·7	22·8	Light yellow, crystallised almost throughout.	"	"	23402
−15·7	19·0	White; crystallised throughout and almost solid.	"	"	23403
− 7·4	18·4	Yellow; slightly crystallised.. ..	"	"	23404
− 1·9	22·2	Yellow; partly crystallised.....	"	"	23405
−10 1	21·0	Light yellow; crystallised throughout.	"	"	23406
−16·2	21·6	White; crystallised throughout..	"	"	23102
+70·8	26 4	Yellow; clear.....	"	Adulterated by addition of glucose syrup and cane sugar.	23101
−11 4	22·4	White; crystallised throughout..	"	Genuine.....	23407
−14 2	20·6	" " " ..	"	"	23408
−19·2	21·6	Yellow; partly crystallised.....	Miss E. Davidson.	Genuine.....	22047
−17·0	20·8	" crystallised throughout.	"	"	22065
− 7·0	19·2	" clear	"	"	22069
−14·1	21·4	" partly crystallised.....	"	"	22074
−20 0	21·2	" " "	"	"	22080
−13·5	19·4	Light yellow; crystallised throughout.	"	"	22067
−13·0	18·8	Yellow; partly crystallised... .	"	"	22088
−12·0	19·8	" " "	"	"	22091
−14·8	21·4	Light yellow; crystallised throughout.	"	"	22097
− 9·1	20·2	Yellow; crystallised throughout.	"	"	22098
−14·5	21·2	Yellow; partly crystallised.....	Miss E. Davidson.	Genuine.....	17430
+23·0	23·2	Dark yellow; clear	"	Adulterated by addition of cane sugar.	17438
−15·3	19·2	Yellow; crystallised throughout.	"	Genuine	17448
− 7·4	19·2	White; crystallised throughout..	"	"	17449
+19·0	23·0	Brown; clear; smells of buckwheat.	"	Adulterated by cane sugar	17459
−11·6	25·6	Yellow; partly crystallised.....	"	Contains too much water.	17464
+49·1	27·4	Dark yellow; clear.	"	Adulterated by addition of glucose syrup.	17467
−14·5	20·2	White; crystallised throughout..	"	Genuine	17469
+26·4	16·4	Brown; clear; very thick.....	"	Adulterated by addition of cane sugar.	17472

Results of Analysis of 99 Samples

Date of Collection.	Number of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher or given by Vendor or on the Label.	Quantity Collected.	Cost.	Brand or Description.
1903.		*District of Manitoba.*			$ cts.	
April 21	21711	Ouimette & Wallever, Red Deer.	J. Turner & Co., Hamilton	3 jars....	0 75	....
" 23	21715	John West, Wetaskiwin..	" " .	3 "	0 60	.. ..
" 24	21719	J. H. Morris & Co., Edmonton.	Dyson, Gibson Co., Winnipeg.	3 "	0 60	.....
" 25	21726	A. Davies, Strathcona....	" " ..	3 "	0 75	.. ..
" 29	21729	A. W. Ward, Calgary....	" " ..	3 " ...	0 60	.....
		District of British Columbia				
April 16	21686	A. T. Charleton, Port Haney.	Geo. Charleton, Ailsa Craig, Ont.	2 "	0 40	..... .
" 16	21690	Coulter & Berry, Langley.	H. L. Johnson, Chilliwack	3 "	0 75	....
" 16	21699	H. C. Henderson, Chilliwack.	A. Malcomson, Chilliwack.	3 " ...	0 75	. ...
" 16	23503	Mrs. E. A. Farrer, Chilliwack.	G. A. Kipp, Chilliwack....	3 " ..	0 75	....
" 21	23516	S. Petersky, Steveston....	.....	3 " .. .	0 90	.....
" 21	23520	E. Hunt, Steveston.....	San Diego Honey Co., San Francisco.	3 "	0 90	....
" 21	23522	W. C. McBride, Port Guichon.	Pacific Const. Syrup Co., San Francisco.	3 " ...	1 00	....
" 21	23523	Marshall Smith, Ladner's Landing.	Schilling Co., San Francisco	3 " ...	0 90	....
" 25	23542	Speed Bros., Victoria.....	J. Reagh, Ladners's Landing.	3 "	0 75	....
" 28	23549	E. J. Rae, New Westminster.	W. Ross, Ontario Co., California.	3 " ..	0 75	.....

of Honey as sold in 1903—*Concluded*

Results of Examination.			Observer.	Remarks by the Chief Analyst.	Number of Sample.
Direct Saccharimeter Reading.	Water.	Physical Characters.			
−14·5	16·8	White; crystallised throughout.	Miss E. Davidson.	Genuine	21712
−11·0	18·8	White; crystallised almost throughout.	"	"	21713
−12·4	23·2	Yellow; partly crystallised.	"	"	21719
+ 7·1	25·2	Yellow; clear	"	Adulterated by cane sugar	21726
+ 3·5	26·2	" "	"	"	21729
−17·4	16·6	White; crystallised throughout.	"	Genuine	21686
− 8·4	22·8	Yellow; partly crystallised; contains pieces of comb.	"	"	21689
+14·2	18·8	Brown; partly crystallised; very thick; tastes and smells of brown sugar.	"	Adulterated	21699
− 8·2	19·0	Dark yellow or brown; crystallised almost throughout; contains pieces of comb.	"	Genuine	23503
+69·8	21·6	Yellow; partly crystallised; contains pieces of comb.	"	Adulterated with glucose syrup.	23516
+41·6	21·2	" " "	"	"	23520
+42·8	21·0	Yellow; slightly crystallised; contains pieces of comb.	"	"	23522
−14·8	17·0	White; crystallised throughout.	"	Genuine	23523
−10·7	17·0	Yellow; partly crystallised.	"	"	23543
−16·8	15·0	Brown; not crystallised; very thick.	"	"	23549

TABLE II.—Results of further examination of 13 samples Honey showing right handed rotation, by Miss. E. Davidson.

No. of samples.	By Clerget Process.				Approximate percentage of glucose syrup.	By Fehling solution			Dextrine reaction.
	Direct Saccharimeter reading.	Reading after Inversion.	Temperature Centigrade.	Cane sugar by Clerget formula; p. cent.		Reducing sugar, stated as invert.	Reducing sugar after inversion.	Cane sugar, per cent.	
4340	+27·4	+21·3	23	4·65	13·7	62·68	68·04	5·09	Distinct.
21305	+81·0	+71·3	24	7·42	40·5	49·48	54·24	4·52	"
23101	+70·7	+39·3	24	24·02	35·3	40·15	62·60	21·33	"
17438	+22·9	−17·9	24	31·22	.....	42·98	80·08	35·26	None.
17459	+19·2	−16·5	24	27·31	.....	47·15	76·80	28·16	"
17467	+48·6	+35·2	24	10·24	24·3	52·98	63·00	9·52	Distinct.
17472	+26·8	−16·4	24	33·05	.....	45·69	78·75	31·41	None.
21726	+8·5	−15·2	24	18·13	.....	52·49	75·00	21.38	"
21729	+3·9	−14·7	23	14·18	.....	55·60	75·04	18·46	"
21699	+14·1	+10·8	21	2·49	.....	65·13	68·63	3·32	"
23516	+70·1	+55·4	23	11·20	35·0	55·51	65·72	9·70	Distinct.
23520	+41·9	+35·4	23	4·96	20·9	63·38	69·22	5·54	"
23522	+43·5	+32·2	23	8·61	21·7	62·60	70·00	7·11	"

MEMORANDUM REGARDING THE EXAMINATIONS REFERRED TO IN TABLE II.

The samples whose numbers are given in this table are those which shewed right handed rotation in the polariscopic observation noted in Table I, and which were subjected to further examination in order to ascertain whether this behavior was due to glucose syrup or cane sugar, and, in the latter case to determine the quantity of cane sugar present.

They were first examined by the Clerget process the nature of which is very clearly described by Allen (Commercial Organic Analysis, 1898; Vol. I, p. 260). The only difference which has been made in the equations there given is in the change by inversion which instead of 144 has been placed at 142·7 in accordance with the more recent determinations of Wohl. In Table II all the observations were given which are necessary for calculating the cane sugar, the percentage of which is also stated.

The percentage of sucrose present in the samples of Table II was also ascertained by the use of Fehling solution, the details of the process being as follows:—A five per cent solution of the honey sample was first prepared.

(1.) For determining the reducing sugars 10 c.c.m. of it, containing 0·5 grammes of the original sample were treated direct with Fehling solution in excess. The weight of the cuprous oxide produced multiplied by the factor 0·4861 and by 200 gave the percentage of reducing sugars present, stated as invert sugar. The name reducing sugar applies to all the varieties of this substance which act upon Fehling solution with precipitation of cuprous oxide. Dextrose, grape sugar, starch sugar, levulose or fruit sugar, the mixture of dextrose and levulose called invert sugar, and certain reducing substances which form in the syrup during the manufacture of sugar from the cane are all included under "reducing sugars." The term excludes cane sugar which does not act upon Fehl-

ing solution previous to inversion. The factor 0·4861 is based upon work done by Mr. F. W. Babington (Analyst, Vol. xvi., p. 181) and represents the cuprous oxide yielded by 1 gramme of invert sugar derived from inverting by dilute acid 0·95 grammes of cane sugar and precipitating by Fehling solution.

(2.) For ascertaining the quantity of cane sugar present 50 cem. of the above mentioned five per cent solution of the honey were inverted by the action of 2 ccm. hydrochloric acid, then rendered slightly alkaline by potash solution and made up to 100 ccm. 10 ccm. of this inverted solution, containing 0·25 grammes of the original sample were then treated with excess of Fehling solution. The cuprous oxide produced multiplied by 400 and the factor 0·4861 gave the percentage of reducing sugar, including that derived from the inversion of the cane sugar present. The direct percentage, as ascertained under (1) was then deducted from the percentage after inversion, and the difference multiplied by 0·95 which gave the percentage of cane sugar in the sample. It will be seen from the table that the percentages thus obtained confirm, on the whole, with sufficient accuracy, those obtained by the Clerget process.

Allen states that, in the absence of added cane and invert sugar, an approximate estimation of the proportion of glucose syrup in honey may be made by reckoning 1 per cent of the adulterant for every degree of dextro-rotatory power possessed by the sample. Following this rule the percentage of glucose syrup present in the 13 samples of Table II are given in one of its columns.

The samples in question were also subjected to a qualitative test for dextrine which is usually a constituent of commercial glucose syrup. This test was applied in the manner described by Haenle (Die Chemie des Honigs ; Strasburg, 1892), 5 ccm. of a 33⅓ per cent solution of the sample are placed in a test tube, and 2 ccm. of absolute alcohol gently added. If dextrine is present a white turbidity is observable at the contact plane of the two fluids, which is caused by the separation of the dextrine, and disappears on mixing. Cane sugar treated in this way, and honey as a rule do not give this reaction. In Table II a column is given which shows the results of this test when applied to the different samples.

T. M.